

A NEW SPECIES OF *PLECIA* FROM THE GREEN RIVER
FORMATION AND NEW COMBINATIONS OF
FOSSIL BIBIONIDAE (DIPTERA)

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ABSTRACT.—*Plecia akerionana*, n. sp., is described from the Green River Formation, Colorado, and diagnosed with *P. minutula* Rice, *P. myersi* Peterson, and *P. rhodoptera* Cockerell. *Plecia intermedia* (Scudder), the genotype of *Mycetophactus*, and *Plecia creedensis* James are transferred to the genus *Penthetria*, and *Hesperinus immutabilis* Melander is transferred to *Plecia*.

Key words: Diptera, Bibionidae, fossil, *Plecia*, new species, Green River Formation.

Over 20 fossil species in 5 genera of Bibionidae have been described from the shales of Florissant, Colorado (Oligocene), while only 4 species, all belonging to the genus *Plecia*, have been described from the Green River Formation, Colorado/Wyoming/Utah (Eocene). Although there are few bibionid species known from the Green River Formation, they are among the more abundant Diptera, as was found in a survey of several sites in the Parachute Creek Member of the Green River Formation (Codington 1993) in which Bibionidae represented 22% of Diptera specimens. One Green River site (site F-1, Wyoming) is particularly rich in bibionid specimens, with 80–96% of all insects representing *Plecia pealei* Scudder (Scudder 1890, Grande 1984).

This study describes an additional species of *Plecia* from the Green River Formation, Colorado, and reassesses generic assignments of several other fossil bibionids described from Colorado.

Morphology follows McAlpine (1981). Measurements were made with an ocular micrometer. Wings were illustrated with the aid of a camera lucida. The following individuals made materials available for study: Philip Perkins and Michael Kelley, Museum of Comparative Zoology, Harvard University (MCZC); Virginia Scott (entomology) and Peter Robinson (paleontology), University of Colorado, Boulder (UCMC); Conrad Labandeira and Mark Florence, National Museum of Natural History, Smithsonian Institution (USNM). Specimens have been deposited at these institutions.

Genus *Plecia* Wiedemann

Plecia Wiedemann, 1828: 72. Type species: *Hirtea fulvicollis* Fabricius, 1805, by subsequent designation of Blanchard (1840: 576).

Plecia akerionana Fitzgerald,
new species
(Figs. 1–3)

HOLOTYPE.—♀, USA: COLORADO: Rio Blanco County, 4 mi W Rio Blanco, Bob Hammon (USNM #498201).

ETYMOLOGY.—The specific epithet is derived from the Greek *akerios* (lifeless) and *nan* (dwarf).

DISCUSSION.—*Plecia akerionana* was collected from the upper Parachute Creek member of the Green River Formation (Lake Uinta Locality U-2 [of Grande 1984]) and is estimated to be 45–47 million yr old (Dayvault et al. 1995).

DIAGNOSIS.—*Plecia akerionana* can be distinguished from most other North American fossil *Plecia* by its minute size and is most similar in size to *P. rhodoptera* Cockerell (Green River Formation, Colorado, Eocene), *P. myersi* Peterson (Canadian amber, Cretaceous), and *P. minutula* Rice (British Columbia, Eocene). Table 1 provides wing measurements for comparison of the 4 smallest (based on wing length) species of Nearctic *Plecia*. *Plecia akerionana* is most similar to *P. myersi* but can be distinguished by the longer and relatively narrower

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TABLE 1. Comparison of wing measurements of the 4 smallest Nearctic fossil *Plecia* species (*P. minutula* Rice, *P. rhodoptera* Cockerell, *P. akerionana*, n. sp., and *P. myersi* Peterson) using methods of Rice (1959) and Melander (1949); measurements of *P. minutula* and *P. myersi* are taken from Rice (1959) and Peterson (1975), respectively. Wing measurements in mm.

	<i>minutula</i>	<i>rhodoptera</i>	<i>akerionana</i>	<i>myersi</i>
Rice (1959) ^a				
WL	5.3	5.00	3.47	2.70
WW	2.2	2.16	1.32	1.20
RL	3.1	3.12	2.45	1.92
AxC	0.63	0.62	0.36	0.35
R3+4	1.0	0.84	0.38	0.35
R5	1.5	1.64	0.99	0.50
SC	0.38	0.34	0.19	0.20
RF	1.4	1.54	1.40	1.07
RAx	0.9	0.86	0.57	0.47
MC	0.35	0.20	0.15	0.07
Melander (1949) ^b				
A-B	*	0.86	0.57	0.47
A-C	*	1.92	1.32	1.10
A-E	*	1.54	1.40	1.07
A-L	*	3.20	2.39	1.87
B-G	*	0.38	0.17	0.22
B-J	*	0.22	0.15	0.07
C-D	*	0.40	0.34	0.20
C-F	*	1.36	1.20	0.90
C-P	*	0.22	0.23	0.17
D-F	*	1.04	0.82	0.65
D-H	*	0.34	0.19	0.20
E-D	*	0.84	0.38	0.30
E-F	*	1.64	0.99	0.82
M-J	*	0.44	0.67	0.50
M-K	*	0.76	0.88	0.75
N-O	*	0.70	0.57	0.52
P-R	*	0.18	0.23	0.20

^aKey to wing measurements of Rice (1959): WL = wing length; WW = wing width (at point of Rm crossvein; Rice does not indicate at what point this measurement is taken); RL = length of radial sector; AxC = distance between Rm crossvein and costa; R₁₊₄ = length of R₂₊₄ from fork to tip; R₅ = length of R₄₊₅ from fork to tip; SC = height of submarginal cell at tip of R₂₊₄; RF = distance between origin of radial sector and its fork; RAx = distance between origin of radial sector and Rm crossvein; MC = height of cell sc (marginal cell) at point of Rm crossvein.

^bFor key to wing measurements see Melander (1949) or Peterson (1975).

*Measurement not available.

wing (Table 1), younger age, and ratio of the Rm crossvein to the pedicel of M₁₊₂ 1:1.5 in *P. akerionana* and 1:3 in *P. myersi*. However, due to the difference in age, locality, and type of preservation, *P. akerionana* more likely would be confused with *P. rhodoptera*, which can be distinguished by the longer, relatively wider wing (Table 1, Fig. 4) and R₂₊₃ straight (Fig. 4) rather than evenly curved (Figs. 2, 3).

The 4 *Plecia* species known from the Green River Formation are, based on wing length, significantly larger and thus easily distinguished from *P. akerionana*: *P. dejecta* Scudder (wing 7.5 mm long × 3.0 mm wide), *P. pealei* (10.0 mm × 3.5 mm), *P. rhodoptera* (5.00 mm × 2.16 mm), and *P. woodruffi* Cockerell (7.0 mm × 2.75 mm).

GENERAL DESCRIPTION.—Compression fossil on pentagonal piece of light gray shale approximately 5 cm × 5 cm and 2.0–5.5 mm thick. Dorsoventrally preserved with wings and legs outstretched (Fig. 1). Reverse not present.

FEMALE.—Head dark brown. Left antenna with at least (basal segments difficult to distinguish) 9 round, compact segments, apical flagellomere small, nipple-like. Anteromedial region of head with 2 faint, segmented?, light brown structures (likely the labial palpi). Thorax and scutellum light brown. Legs (apex of right mid-femur, tibia, and 5 tarsomeres, apex of right fore femur, tibia, and 4? tarsomeres, apex of left mid-femur and tibia, and apex of left fore femur and tibia) brown with dense, short, dark brown, appressed hair. Apices of



Figs. 1-2. *Plecia akerionana*, photograph of holotype: 1, habitus; 2, wing.

fore tibiae more robust than that of mid-tibiae. Right fore and mid-tibiae with short, slender anteroapical spur. Right mid-basitarsus 0.40 mm long, 5 times as long as wide, tarsomere two 0.17 mm long, tarsomeres three through five 0.50 mm long. Right fore basitarsus 0.54 mm long, 6.75 times as long as wide. Wings (anterobasal portion of left wing and right wing minus most of anal lobe) light brown fumose. Wing tip slightly pointed, without anteroapical emargination. Anterior veins (especially costa, subcosta, radius, radial sector, R_{2+3} , and R_{4+5}) dark brown, posterior veins lighter. Pterostigma absent. Pedicel of M_{1+2} 1.5 times as long as Rm crossvein. R_{1+5} 2.6 times as long as R_{2+3} . R_{2+3} relatively short and vertical, evenly rounded (Figs. 2, 3). See Table 1 for wing measurements. Abdomen dark brown, posterior end (tergites 5 on) concealed under rock layer. Posterior edge of each tergite with a thin darker brown line marking the division between tergites. Abdomen robust, somewhat swollen in appearance.

MALE.—Unknown.

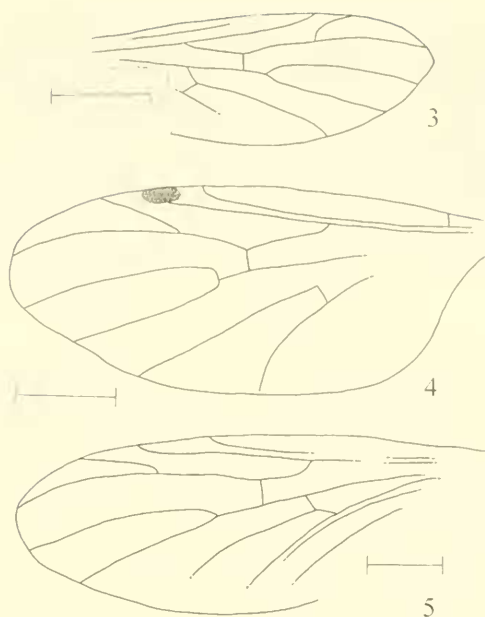
Plecia immutabilis (Melander)

(Fig. 5)

Hesperinus immutabilis Melander, 1949: 20. Holotype (#112554) (USNM), USA: COLORADO: Florissant, Lacey collection.

Plecia immutabilis (Melander), new combination.

DISCUSSION.—The family Hesperinidae (or subfamily Hesperinae of the Bibionidae depending upon current views of classification; treated here as Hesperinidae) is differentiated in part from the Bibionidae by the antennal flagellomeres slender, elongate, and antenna longer than the thorax (Hardy 1981, Rohdendorf 1991). This differs greatly from the antenna of typical Bibionidae, which have relatively short, stout antenna with compact flagellomeres. Examination of the holotype of *H. immutabilis* is not particularly helpful as the antennae are not visible, although based on wing venation (R_{2+3} oblique in relation to R_{4+5}) the specimen clearly belongs to *Hesperinus* or *Plecia* (Fig. 4). However, the photograph of paratype #112588 (USNM) of *H. immutabilis* provided by Melander (1949) reveals that the antenna are of the bibionid and not the hesperinid type. Melander (1949) also treats species of *Plecia* described by Cockerell as *Hesperinus* and apparently was



Figs. 3–5. Interpretation of wing of holotype: 3. *Plecia akerionana*; 4. *Plecia rhodoptera*; 5. *Plecia immutabilis*. Bar = 1 mm.

not clear on the characters that distinguish these 2 genera. The shape of the antenna and the shorter R_{2+3} , oblique in relation to R_{4+5} , indicate this species belongs to the genus *Plecia*.

Genus *Penthetria* Meigen

Penthetria Meigen, 1803: 264. Type species: *Penthetria funebris* Meigen, 1804, by subsequent monotypy in Meigen (1804: 104).

Mycetophaetus Scudder, 1892: 20. Type species: *Mycetophaetus intermedius* Scudder, 1892, by monotypy, new synonym.

Penthetria creedensis (James)

Plecia creedensis James, 1938: 114. Holotype female (#4523) (MCZC), USA: COLORADO: slopes of Willow Creek near Creede.

Penthetria creedensis (James), new combination.

DISCUSSION.—Based on wing venation in the illustration of *P. creedensis* provided by James (1938: 115, Fig. 2) and examination of paratype #19117 (UCMC), this species belongs to the genus *Penthetria*. *Penthetria* can be differentiated from *Plecia* by R_{2+3} longer than and nearly parallel to R_{4+5} .

There seems to have been some confusion among early workers in distinguishing *Plecia*

from *Penthetria* as Cockerell (1911), discussing the genus *Plecia* from Florissant, Colorado, states that "the genus is still found in the same region," referring to *Penthetria heteroptera* Say (extant Nearctic *Plecia* are found only in semi-tropical parts of the southeastern United States). Furthermore, historic specimens examined (UCMC), identified by James as "*Plecia heteroptera*," also represent *Penthetria heteroptera*.

Penthetria intermedia (Scudder)

Mycetophaetus intermedius Scudder 1892: 20. Syntypes (#3494, 3463; reverse of one another) (MCZC), USA: COLORADO: Florissant.

Plecia intermedia (Scudder) (as treated by Evenhuis 1994).

Penthetria intermedia (Scudder), new combination.

DISCUSSION.—Scudder (1892) erected the monotypic mycetophilid genus *Mycetophaetus* to include the species *intermedius*. Although finding formal synonymy of the genus has been nebulous, various authors have treated *Mycetophaetus* as an extinct genus of Hesperinidae (Rohdendorf 1974), Mycetophilidae (Carpenter 1992), and a junior synonym of *Plecia*, Bibionidae (Evenhuis 1994). Examination of the syntypes of *P. intermedius* and the illustration provided by Scudder (1892: Plate II, Fig. 5) clearly places this species in the bibionid genus *Penthetria*, which is differentiated from *Plecia* by R_{2+3} longer than and nearly parallel to R_{4+5} and from Hesperinidae by the short, compact antennal flagellomeres.

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